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Web site accessibility and usability: towards more functional sites for all

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Abstract

Purpose – The purpose of this paper is to explore both accessibility and usability and examine the inhibitors and methods to evaluate site accessibility. Design techniques which improve end-user access and site interactivity, demonstrated by practical examples, are also studied.

Design/methodology/approach – Assesses various web sites for accessibility and usability.

Findings – Criteria are determined by which to assess accessibility and usability of web sites.

Originality/value – Disability is an important consideration in the development of contemporary web sites. By understanding the needs of all users, not only those with disabilities, organisations may begin the process of advancing both accessibility and usability and integrating these elements into their web development strategies.

Keywords Worldwide web, Internet, Design, Disabilities

Paper type Conceptual paper

Introduction

The issue of web site accessibility has hitherto been largely ignored in favour of more innovative development practices that test new technological boundaries (Haas, 1998). Despite this paper being written during the early formative years of the internet, Lilly (2003, p. 397) reaffirms that accessibility remains an issue with regard to web sites by stating that many people with disabilities are currently unable to take advantage of the opportunities afforded by the web. This is attributable largely to badly designed and/or inaccessible web sites which prevent them from fully experiencing the graphical and aural benefits of the medium. This raises several concerns for organisations that may currently be lagging behind in conforming to legislative requirements for the provision of an accessible web site. The Guidelines for State Government Web Sites (2002) highlight the requirement under the Disability Discrimination Act (1992) for site owners to provide “equitable access to people with disabilities”, which should be addressed in pursuit of improved accessibility. Due to its broad definition, this requirement may be open to various interpretations and thus provide a climate of risk to site owners, as legal precedents do not exist in many instances to test the practical application of this legislation.

Webdale (2003, pp. 8-9), however, suggests that accessibility could become a driver for overall site usability as companies who are not currently actively pursuing online accessibility as part of their current strategies will be encouraged to do so if faced with the threat of legal action. This situation could be interpreted as a general reluctance on the part of organisations to develop more accessible sites, and may further indicate that they do not believe that they would derive any clear benefit from such site enhancements. Against the backdrop of this negative perception of accessible web



sites, this study will examine whether it is possible for web sites of complex organisations to meet both their operational needs, within budgetary constraints, and also be accessible. To achieve this, the following questions will be answered:

- What is the importance of disability, and why is it important to consider it when designing web sites?
- How might considering disability design practices actually improve design for all users?
- What are the problems facing organisation who pursue accessible design processes?

Next, the paper will undertake an in-depth examination of the two key elements of usability and accessibility which influence effective web site structures, and more specifically, the relationship between the two. This will lead on to look at the impact that their combined role has on web site architecture, and the methods that may be employed to enhance the experience of all web users.

Background

According to Haas (1998), there is an increasing requirement, both commercially and legally, to provide sites that deliver information to all users in the same manner, and preventing the creation of technological elitism, which favours those individuals who do not have a disability. In effect, it is suggested that individuals who have a disability are demoted to second-class netizens who are precluded from normal online participation (Haas, 1998). Lilly (2003, p. 398) outlines that, in Australia, policies such as the Commonwealth Disability Strategy promote the idea that people with disabilities have the same rights as everyone else to access worldwide web services, thus aligning with internet architect Berners-Lee's vision of making this network accessible to all, regardless of disability.

Whilst the issue of accessibility may be viewed as being primarily concerned with providing information to the disabled, Ivory and Hearst (2002, p. 1) identify lost productivity and revenue as other areas where an inaccessible web site may further impact on organisational efficiency. Therefore, the need to provide both accessible and usable web sites and an effective, sustainable management regime may emerge as a significant driver for improved web site design. The Guidelines for State Government Web Sites (2002) define a number of "non physical" disability elements that have significant impact on the delivery of web services, particularly within academic institutions and other areas characterised by dynamic and changing web landscapes. Key areas for consideration include people:

- who have difficulty reading or comprehending text;
- accessing the internet via a slow connection;
- using a small screen (e.g. a mobile phone) to access the internet;
- who do not understand the language that the information is provided in; and
- who are using software like an early browser version that does not support more recently developed tools like DHTML or JavaScript.

In addressing web site accessibility, the internationally recognised applicability of the W3C has emerged as an important benchmark in applying uniform web accessibility standards (Elges, 2003, pp. 26-8). Whilst the W3C does not possess any legal standing, and thus the implementation of their standards is not mandatory, they nonetheless provide valuable input in the web arena in regard to determining suitable methods that improve web site accessibility and usability. Most notably, the W3C have developed Web Content Accessibility Guidelines, which seek to define the elements of web design that extend the level of site accessibility to include people with disabilities. The need to ensure that the web interface remains consistent throughout the site is, according to Ivory and Hearst (2002, p. 1), a further area that if systematically addressed, contributes to the overall usability of sites and provides a positive experience for all site visitors. Identifying this element as “experience design”, it encompasses information design, navigation design and graphic design, all of which play a key role in overall site accessibility. While this is an important milestone in pursuit of improved site accessibility, there is also a need to foster a perception among web developers that accessibility is an essential rather than an optional tool. With this approach in place, improved accessibility standards may be pursued which are viewed as an “integrated” rather than an “add on” design element.

As the primary focus is placed on web site accessibility, there is also a need address the issue of site usability, which seeks to harness the functionality of the sites to provide a time-efficient and effective delivery mechanism for online information. The advancement of site usability is largely achievable by first understanding the concept of human-computer interactivity, then developing web sites which provide a sufficiently intuitive environment that supports this. In pursuit of deeper understanding of the human interplay between computer technologies Foley (2003, p. 3) suggests that the relationship should be viewed against the backdrop of a global arena which is influenced by the individual experiences of site users. This approach provides some insight into individual requirements and perceptions and should thus be integrated into the web design process.

The close relationship between accessibility and usability, while distinct entities, are according to Webdale (2003, pp. 8-9), interlinked and thus cannot be viewed, or applied in isolation. Sites that are developed to meet accessibility standards are generally, but not always, more usable in their practical application. This may be attributable to the similarity between the concepts shared by both accessibility and usability, such as the inclusion of appropriately contrasting colour schemes and the exclusion of non-browser compliant elements such as JavaScript on web pages. While it cannot be definitively stated that all accessible sites will be usable, for example in instances where a site conforms to accessibility standards, the site may nonetheless not be constructed in an intuitive fashion that is easy to navigate so may not pass usability tests. Rzepka (2003, p. 73) sums up the interplay between usability and accessibility, suggesting that sites that are “accessible” may not necessarily be “usable” in terms of ease of navigation and intuitive layout for both disabled and non-disabled people. The development of web sites that conform to both accessibility and usability standards will support the creation of web environments which perform their function more effectively and provide an enhanced experience for the user: thus accessibility and usability standards are central to good design methodologies.

Concepts defined

The concepts of accessibility and usability are defined by Chadwick (2001) as follows. "Usability" refers to how easy the web site is for everyone to use, and incorporates design layout patterns that may be "learned" by users who then may explore the site and derive value from its contents. Webdale (2003, pp. 8-9) extends this definition to cover the ability of users to "interact" with a digital platform, suggesting an exchange element which is facilitated through the technological medium. Lastly, Foley (2003, p. 3) proposes that thinking should progress the notion of an interactive element to consider technology as a "theatre", characterised by an environment which is interpreted and shaped by the personal experience of the viewer. The concept of a computer as an "agent", suggests Foley (2003, p. 3), is not only important as a link between the web site and the user, but also has influence on the design strategies adopted by web developers. By forcing developers to contextualise web users in terms of their experiences, background and abilities, they are able to focus on developing a web environment which targets their needs and provides enriched interactivity.

On the issue of web site usability, Peter (2002, p. 3) suggests that while this term primarily describes the ability of users to navigate through the site easily and quickly, there exist more subtle components of the overall experience that also play an important role in enriching the usability process. By addressing the critical usability elements of the design process, most specifically the site navigation architecture, and ensuring that it is intuitive and consistent with usability feedback received, users are easily able to move around the site and are better able to focus on the content. It could be concluded therefore that a usable site "leads" users through the site rather than "pushing" them towards the information. Smulders (2001) notes that users should be given "control" of the navigation, achievable through the implementation of simple, traditional design layouts. This facilitates easy movement around the web site, and serves to "imprint" the navigation structure onto the user, assisting them to easily navigate the site during subsequent visits.

In analysing the differing but overlapping definitions of usability, it is evident that it is primarily concerned with the establishment of a web environment which, in addition to providing access to all users irrespective of physical impediments, also seeks to heighten awareness of the online "experience" for both user and developer, thus fostering a cooperative unity between the parties. In pursuit of enhanced site usability, this close relationship should be driven primarily by the web development custodians, whose ownership of the agenda is pivotal in ensuring that the site maintains a high level of usability by:

- *Integrating key design elements that respond to the changing needs of web users* – This may be achieved through the provision of facilities such as feedback forms or surveys which elicit specific responses related to the web environment, which tests the site for usability. The diversity of the audience will provide breadth of responses, offering additional insight into the site delivery mechanisms.
- *Keeping abreast of usability advancements* – This is particularly important where such elements directly impact on interactive site components and thus influence the functionality of the site. Feedback received from user responses may be used to pursue site enhancements or trigger new avenues of usability that address changing user needs.

- *Develop collaborative communities between users and developers* – Provide facilities such as discussion forums which permit web developers to engage one another in discussions that interactively examine the user experience as provided by the web developer. In particular, more abstract information such as perceptions and conceptual appreciation for the web as a whole may be elicited during these engagements. In illustration of this, Webdale (2003, pp. 8-9) notes that elements such as the speed of sites is viewed by many users in terms of the length of time that it takes to complete their intended tasks, rather than the speed of the page download. The astute developer would therefore consider such factors when seeking to enhance web site usability, and address them by through better understanding of and implementation of intuitive architectures.

“Accessibility” refers to the extent by which the web site, including the technology such as hypertext coding, is barrier-free to all users of the information, thus providing enhancements that enable people with disabilities to move towards independence (Foley, 2003, p. 9). Neal (2003, p. 2) suggest that web accessibility is the ability for a person using any agent (software or hardware that retrieves and renders web content) to understand and fully interact with a web site’s content. The two definitions identify common ground in terms of both human and machine interactivity. However, to better understand the issues associated with accessibility, Carter and Markel (2001, pp. 226-7) identify four main categories of disabilities which influence the ability of people to access the web. These include:

- mobility, which covers inadequate dexterity in operating a mouse, keyboard or other computer peripheral device, often experienced by people who have lost a limb;
- hearing, which extends to diminished levels of hearing to no hearing at all;
- vision impairments, such as partial or total blindness, most commonly colour blindness; and
- cognitive and learning, which involves various difficulties in reading, understanding, staying focused, remembering and writing.

Disabilities related to hearing and vision are frequently targeted as having the most impact on users. However, mobility, hearing and cognitive and learning are also important components of web design that warrant attention, in pursuit of improved overall site accessibility. While hearing impairments may be readily quantified in terms of degrees of accessibility, and provision may be made for users with the lowest common denominator, namely total deafness, cognitive and learning elements on the other hand pose a more complex problem in addressing users who fall into that category. Similarly, mobility issues are not easily ascertained and addressed and therefore it requires evaluative methodologies to be devised which elicit responses that provide insight into the accessibility requirements of affected individuals.

Webdale (2003, pp. 8-9) extends the definition of accessibility to encompass the ability of disabled people to use a digital interface (web page), and further suggests that many sites which conform to accessibility standards may lack many of the critical components of usability. Webdale (2003, pp. 8-9) further proposes that it is impossible to separate the two interrelated elements of usability and accessibility as they effectively complement each other. Figure 1 extends the notion of a complementary

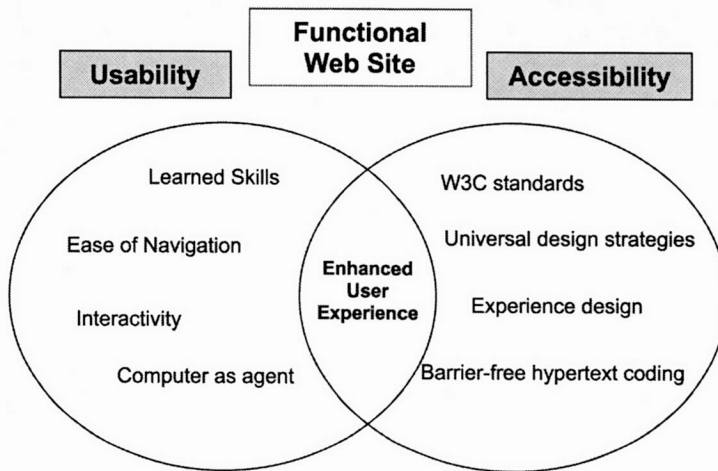


Figure 1.
Complementary
relationship between
usability and accessibility

relationship proposed by Webdale (2003, pp. 8-9) and highlights the convergence of each to produce an enhanced experience for all users. In a practical demonstration of this relationship, the usability element “learned skills” may be correlated with the accessibility element “experience design” as they both focus on the central human experience and the ability to understand and interact with the web interface.

Inhibitors of accessibility on the web

Alexander (2003) suggest that with almost one in five Australians currently classified as having a disability, there is a need to begin to introduce strategies that promote web design which focuses on “universal readership”. By targeting maximum inclusion in terms of human and technological boundaries, sites may be developed which incorporate improved accessibility elements, resulting in overall usability for other users. Therefore the need to actively pursue accessibility and usability strategies has been demonstrated as having both a legal and financial basis, yet organisations are at best slow to begin to tackle these issues.

At the same time, many organisations remain uncommitted to implementing any large-scale accessibility focused web development initiatives, despite the clear advantages associated with doing so. Carter and Markel (2001, pp. 226-7) question this phenomenon while noting the following inhibitors of web site accessibility enablement:

- many organisations are “not interested” in making sites accessible, suggesting that strong motivators such as legislative requirements to provide an accessible web site is not sufficient incentive to pursue a proactive accessibility initiative;
- making the site accessible makes it boring – this perception is based on the mistaken belief that an accessible site lacks any graphics or multimedia elements, when this is clearly not the case; and
- “We don’t want to spend the money” is an oft-cited phrase which perpetuates the myth that additional resources are required to make sites accessible, in particular additional staff who specialise in the web-based accessibility field.

In analysing these inhibitors it is evident that much of the current reluctance on the part of organisations may be attributable to a lack of understanding for the principles of accessibility and usability. The fact that organisations claim to be disinterested in accessibility issues suggests that they may not be aware of their legislative responsibilities to advance accessibility, or that by improving accessibility they could reap financial benefits. The notion that accessible sites are “boring” may have had some basis during the early days of web site development, in that a simple method of addressing the page accessibility was by opting for a “text-only” version. Advances in web-based graphic design tools that support improved file compression and allow quicker loading of graphic images. The use of “web safe” colours, however, may provide less options than would a full colour palette, which may be viewed as detracting from the overall appeal of the site; however, sufficient colour choices are nonetheless available. The last inhibitor, which suggests that companies have the perception that there is a high cost associated with the development of accessible web sites is easily challenged in as much as there is some suggestion that well developed sites actually generate income and could thus be deemed to increase rather than decrease organisational wealth.

Enhancing web site accessibility

The path to web site accessibility requires proactive efforts on three fronts within the organisation. First there should be active support from management, which may require a shift in organisational culture, to accommodate and promote this new direction in web accessibility. This would serve to develop a framework from which accessibility information could be disseminated from senior management through to administrative and web development staff members.

Second, an educational program should be formulated which seeks to outline to all employees the legal responsibilities as well as the financial benefits to the organisation of providing an accessible and usable web site. Lastly, web developers, as custodians of the accessibility elements, should receive appropriate training in coding techniques which adhere to W3C standards and minimise common development barriers. Carter and Markel (2001, pp. 226-7) highlight W3C accessibility barriers that should be addressed by developers to improve site access and usability. Firstly, alternative text < ALT > tags in images and hotspots provide a means by which sight-impaired users, using screen readers, are able to receive web page information. In many instances the ALT tags are either absent or simply list vague descriptors such as “image 1”, which provide no indication of the content of the image and may confuse the viewer. In addition, it is proposed that the use of misleading structural elements on a page, such as frame-based information and tables that are linearised, present interpretation problems to screen reader technology, and should therefore be avoided.

Whilst many of these elements are geared towards addressing the needs of the visually impaired, as they aid the successful interpretation of hidden page code by screen readers and other similar devices in use by disabled site users, the able-bodied user will also derive benefit from a well developed site, as accessible sites are often more usable.

Given that colour contrast issues impact on both sighted and sight-impaired people, in varying degrees, the need to design web pages that address this issue is of paramount importance. To achieve this, critical colour choice of both the page

background and text should be taken based on contrasting colours so as to minimise the effect of the text blending into the background. The size of the text is also a further factor for consideration, as this should meet minimum standards to allow people with visual impairments to easily view the material.

Carter and Markel (2001, pp. 226-7) highlight that rapid technological advancements, in particular in regard to web design practices, have challenged the capabilities of web designers, who in many instances are unable to keep abreast of the critical developments which influence accessibility. This situation, it is suggested, makes the web more exclusionary due to developers focusing on the majority of users who do not have a disability, to the detriment of those with a disability. To overcome this problem, suggest Carter and Markel (2001, pp. 226-7) requires the implementation of "universal design" strategies which promote standardisation and uniformity of site structure and composition.

Practical example: Curtin University of Technology web template

In alignment with the theory of universal design proposed by Carter and Markel (2001, pp. 226-7), Curtin has developed and introduced a standardised web page template which addresses a number of common accessibility and usability problems present in contemporary web design practices (see <http://online.curtin.edu.au/resources.html>). The resulting web template met the key requirements outlined below.

First, it sought to address the issue of multiple browsers operating on multiple operating systems, whilst omitting elements such as JavaScript which would preclude some browsers from viewing the material. Elges (2003, pp. 26-8) reinforces this element by suggest that older browsers, text browsers or computers set to view text-only material will more easily process this information in line with the intentions of the publisher.

Alternative (ALT) descriptive text has been included which provides information on images that are not visible to sight-impaired users. Elges (2003, pp. 26-8) suggests that, in addition to ALT text, such descriptors should also include link destination information, thereby aiding the navigation process.

The value of the new template also extended to address the usability component of standardisation in site design which enabled users to become familiar with the site and, over time, "learn" its functionality. This is an important element with broader impact on the overall usability of the University web site, which if implemented widely will provide an environment where users will be presented with an intuitive and consistent environment.

Conclusion

From this examination of accessibility and usability issues it has been demonstrated that disability is an important consideration in the development of contemporary web sites. By understanding the needs of all users, not only those with disabilities, organisations may begin the process of advancing both accessibility and usability and integrating these elements into their web development strategies. While it has been suggested that the uptake on web site accessibility has been largely slow, and driven in part by the threat of legal recourse, the added benefits associated with the introduction of improved usability for all stakeholders may prove to be the trigger to more widely implemented initiatives.

Despite the compelling reasons which exist to develop accessible and usable web sites, however, many organisations lag behind in the implementation of these elements of web design. The notion which suggests that the development of accessible web sites is a cost-intensive exercise has been a factor in inhibiting strong uptake in this area and needs to be addressed before large-scale progress can be made in this area. This paper has challenged that thinking and provided an alternate point of view which suggests that the combination of accessibility and usability, due to their close relationship, enhance the efficiency of the site for the user and provide an efficient medium by which to access corporate information.

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